The TTEP Quarterly

Volume 2, Number 3 April 2007

The quarterly update of U.S. EPA's Homeland Security Technology Testing & Evaluation Program (TTEP)

EPA's Portable Pipe Loop to Enhance Water Security Technology Evaluations

For almost 2 years, EPA has been in the process of designing and fabricating a portable, recirculating pipe loop that can be used to conduct a variety of research projects using biological and chemical agents. In late January, fabrication of EPA's portable pipe loop (PPL) was completed and in February it was delivered to Battelle. As shown in the pictures below, the pipe loop consists of two castor-mounted racks fabricated almost entirely from 316L stainless steel. The equipment rack contains a 20-gallon mixing tank, a 7.5 horsepower centrifugal pump with a variable frequency drive capable of providing flow rates ranging from 0.5-5.5 feet per second, a flow meter, a peristaltic pump to be used for contaminant injection, and a capture tank for single-pass experiments.

The piping rack contains approximately 95 feet of three inch diameter stainless steel pipe. In addition, this rack is equipped with eight sampling or instrument ports, optical glasses for visual inspection of the water flow, removable sections of pipe, and valve configurations that can allow the use of some or all sections of the pipe. The PPL will be used on an upcoming TTEP test of multi-parameter water monitors. This evaluation will focus on the response of water quality parameters to injections of toxic industrial chemicals, biological agents, and chemical agents. If you have questions, contact Dr. Jeff Adams (adams.jeff@epa.gov or 513-569-7835) or Dr. Ryan James (jamesr@battelle.org or 614-424-7954).


Piping Rack


Connected System


Equipment Rack

Welcome to TTEP

The U.S. Environmental Protection Agency (EPA) is actively participating in the national homeland security effort by ensuring the protection of the nation's drinking water systems and the safety of the public in buildings and other structures. EPA's Office of Research and Development's National Homeland Security Research Center (NHSRC) has established the Technology Testing and Evaluation Program (TTEP) to assist this effort. TTEP is conducting third-party performance evaluations of commercially available homeland security technologies, incorporating stakeholder guidance and a high degree of quality assurance (QA) oversight. Questions about TTEP should be directed to Mr. Eric Koglin (koglin.eric@epa.gov or 702-798-2332).

TTEP Water Security Stakeholder Meeting

On March 15, 2007, EPA's TTEP Water Security stakeholder committee met at Battelle in Columbus, OH. The stakeholders heard updates and added technical insight pertaining to the evaluations of ultrafiltration cartridges, multi-parameter water monitors, and the expeditionary unit water purification system. The committee also took part in a tour that showcased the operation of the newly completed EPA portable pipe loop. Discussions also prioritized technology category areas for future evaluation.

Comparison of Decontamination Methods for *Bacillus Anthracis*

In addition to evaluating methods and equipment for decontaminating indoor environments following an intentional release of a biological agent, EPA also evaluates test methods for use in registration of pesticides, including sporicidal products for the inactivation of *Bacillus anthracis* spores – the biological agent responsible for anthrax.

To efficiently achieve related objectives, the EPA National Homeland Security Research Center and the EPA Office of Prevention, Pesticides and Toxic Substances (OPPTS) are collaborating under TTEP to perform parallel efficacy testing of fumigation and liquid decontamination technologies for *Bacillus anthracis* Ames by using three different approaches or standard methods.

The methods include:

- AOAC Official Method 966.04, Sporicidal Activity of Disinfectants: Alternative Method II
- Determination of sporicidal efficacy using the quantitative three step method as modified by OPPTS
- Methods developed by Battelle, under the direction of Dr. James Rogers, and used extensively under TTEP for determining efficacy of decontamination technologies for the inactivation of *B. anthracis* on building materials.

The investigation will answer the questions:

- What is the efficacy of decontamination technologies against spores of *B. anthracis* Ames as determined by the three methods?
- For a given decontamination technology, do the three test methods for determining efficacy yield the same outcome?
- For a given decontamination technology, is qualitative analysis of biological indicators consistent with the efficacy results from the three test methods?

The efficacy of various liquid and fumigant technologies against spores of *B. anthracis* Ames and two surrogates *(B. subtilis* and *B. atrophaeus*) will be evaluated at three different contact times at a specified concentration, temperature, and (for fumigants) relative humidity. Spores will be applied to test coupons/carriers specified in the respective test methods. Spore viability after a given treatment will be determined as specified in the respective method.

For further information on TTEP decontamination methods testing, contact
Dr. Shawn Ryan (ryan.shawn@epa.gov or 919-541-0699).

Testing of Screening Technologies for Use in EPA's All Hazards Receipt Facilities

Examples of Screening Technologies Tested

Testing was recently completed under TTEP on 25 technologies that could be used to screen samples in EPA's All Hazards Receipt Facilities (AHRF). The EPA, U.S. Department of Homeland Security, and U.S. Department of Defense have established the AHRF for prescreening unknown and potentially hazardous samples collected during suspected terrorist events. The AHRF are intended to screen incoming samples for chemical, explosive, and radiological hazards, to protect laboratory workers from injury and facilities from contamination, and to ensure the integrity of collected samples. Screening technologies for use in the AHRF must be rapid and qualitative, and preferably of relatively low cost, but must provide accurate identification of hazardous samples.

The screening technologies tested ranged from simple test papers, kits, and color indicating tubes to hand-held electronic detectors based on photoionization detection, electrochemical sensors, ion mobility spectrometry, and flame spectrophotometry (FSP). Testing involved challenges with toxic industrial chemicals (TICs) (hydrogen cyanide, cyanogen chloride, phosgene, arsine, hydrogen sulfide, hydrogen peroxide, chlorine, and fluoride) and chemical warfare agents (CWAs) (sarin (GB), sulfur mustard (HD), and VX) in air, water, and/or on test surfaces. Testing was conducted with TIC or CWA concentrations that would be dangerous to laboratory personnel, and over a range of temperature and relative humidity, and with interferences present along with the TIC or CWA. For each screening technology, the analysis time, operational characteristics, and cost per sample were also evaluated.

Several of the tested technologies were able to accurately detect the TICs and CWAs in air, though no single technology was applicable to all the TICs and CWAs. Few of the screening technologies were able to detect the CWAs in water at the target concentrations used, but all of the technologies tested for detection of VX on surfaces provided accurate indications. The FSP detector tested was notable in its relatively broad applicability to both TICs and CWAs, and to air, water, and surface samples.

The final reports on the AHRF TIC and CWA testing will be submitted to EPA in April. If you have questions about AHRF testing, contact Mr. Eric Koglin (koglin.eric@epa.gov or 702-798-2332) or Dr. Thomas Kelly (kellyt@battelle.org or 614-424-3495).